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ABSTRACT

Both behavioral and cognitive coping strategies are determined by an individual's perception of the stressful stimuli. To investigate the relationship of an individual's usual coping style to differential responses to a behavioral or cognitive stressor in four response systems (heart rate, muscle tension, galvanic skin response, and subjective reports of anxiety), 90 male college students completed a questionnaire assessing their usual behavioral and cognitive coping strategies. They were then exposed to two stressors (white noise tones randomly delivered over a 5-minute period), one requiring a behavioral coping strategy (pressing a bar) and one requiring a cognitive coping strategy (imagining a tree). Physiological and subjective arousal were monitored. The Spielberger State Anxiety Inventory was administered before and after each stress period. Finally, the coping styles of the subjects were assessed by the Repression/Sensitization Scale, the Internal/External Scale, the Miller Coping Scale, and the Tanck-Robbins Scale. An analysis of the results showed that in both conditions, highly behavioral copers exhibited lower heart rate, muscle tension, and anxiety than did highly cognitive copers. However, the reverse was true for galvanic skin response (GSR) with highly cognitive copers exhibiting lower GSR in both conditions. Congruity between usual coping style and stressors did result in less stress as measured by GSR and anxiety. The results indicate that different coping styles may be differentially effective in ameliorating response to stress in different systems. (BL)

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Patterns of Coping, Patterns of Response

The effect of coping strategies on response to stress is a complicated issue.

Recent research indicates that different types of stressors elicit different responses, and different people exhibit different responses to the same stressor. The magnitude of the response to stress may be related to the type of stressor, the usual style of coping, and the system in which response is measured. For example a behavioral response to a stressor is likely to mobilize the skeletal-muscular and cardiovascular systems resulting in larger responses in heart rate and muscle tension than in galvanic skin response. With repeated pairings of behavioral coping strategy with a stressor, a person may become conditioned to respond to stress in heart rate and muscle tension. Any study which attempts to examine the relation of stress to coping must therefore take into account all three of these variables.

The purpose of this study was to see if the variables of usual coping style could be related to differential responses to a behavioral and a cognitive stressor in four different response systems; namely heart rate, muscle tension, galvanic skin response, and subjective report of anxiety as measured by the Spielberger State Anxiety Inventory.

Subjects were assigned a score measuring degree of usual behavioral and usual cognitive coping style on the basis of their responses to the Tanck-Robbins coping questionnaire. All subjects were exposed to both the behavioral and the cognitive stressor in counterbalanced order.

There were three main hypotheses. The first hypothesis predicted that regardless of their usual coping style, subjects would exhibit greater responses in heart rate and muscle tension, but not in skin conductance and subjective response in the situation

requiring a behavioral response than in the situation requiring a cognitive response. The second hypothesis predicted that the degree of usual behavioral coping style would be associated with greater responses in muscle tension and heart rate regardless of the situation. The third hypothesis predicted that there would be a significant interaction effect of situation and usual coping style on subjective response and galvanic skin response to stress. That is, highly behavioral copers in the behavioral situation and highly cognitive copers in the cognitive situation would experience less subjective arousal and exhibit less skin conductance arousal than highly behavioral copers in the cognitive situation and highly cognitive copers in the behavioral situation. This hypothesis is based on the prediction that subjects who are allowed to use a strategy with which they are familiar and for which they possess some competence will more effectively reduce stress than if they are required to use a strategy with which they are not familiar.

In addition several exploratory analyses were conducted. These analyses tried to relate coping style variables, Repression-Sensitization, behavioral-cognitive coping, Internal-External Locus of Control, and the Miller Coping scale, to all of the response variables. The first set of exploratory analyses attempted to see if some combination of the coping variables could be used to predict the system of greatest response. Another set of analyses examined whether all of the coping variables could be used to predict all of the response variables in a canonical correlation.

The results indicated that coping style and type of stressor were significantly related to magnitude of response. In addition, the predicted interaction effect of situation with usual coping style was found. Implications for the etiology of psychosomatic stress related disorders and for preventive programs for stress reduction are discussed.

The effect of coping strategies on response to stress is a complicated issue, partly because different stimuli are viewed as stressful by different people and partly because people have different, unique ways of coping. Stress and coping can be defined by their consequences. A stressful situation is something that increases one's sympathetic nervous system arousal and/or increases one's subjective feelings of anxiety. Coping is a behavioral or cognitive response which lessens the effects of stress. Both of these concepts, stress and coping, are here defined as epiphenomena. That is, their existence is defined as a result of another phenomenon. Stress is defined as certain physiological and subjective changes which are the result of preceiving the stimulus situation and which are usually interpreted by the individual as unpleasant, aversive, or frustrating. Coping is defined in terms of the effects on the magnitude of the stress response. Our definitions are limited to transient situations for which discrete responses, overt or covert, are available as coping mechanisms.

For the purposes of this discussion coping responses will be dichotomized into behavioral and cognitive. A behavioral coping strategy is one in which an overt response, including a verbal response by a subject is made in order to alter the effect of the stressor with the goal of changing the perceived magnitude, threat, or schedule of the stressor. Cognitive coping responses are those strategies which require no overt response from the individual. An example would be a person telling him/her self that the impending electric shock will not hurt very much. These categories are consistent with Averill's (1973) definition of

behavioral and cognitive control. In this paper we will discuss the relation between coping strategies and psychosomatic disorders, the effects of coping on stress, and differences among individuals in patterns of physiological response.

Psychosomatic disorders can be conceptualized as non-adaptive physiological responses to stress. If coping strategies can reduce these physiological responses then an important area of research is the relationship of coping styles to patterns of psychosomatic disorders. There is little empirical work on the relative effectiveness of coping strategies on the various response systems. However, there is a small and intriguing body of work which was conducted by David Graham and his associates on the specificity of the relationship between attitudes and physiological responsivity.

Grace and Graham (1952) interviewed 128 subjects who were self-referred to a university medical clinic with physical complaints. They found that certain attitudes were associated with certain disorders. They hypothesized that attitude influences physiological response under the principle that thought about action brings about small physiological changes. Graham expanded that idea by hypothesizing that when confronted with a stressor, an individual will respond in those physiological systems most consistent with the person's usual mode of response. If a person usually responds by taking flight, then his/her heart rate may increase in response to the stressor, even if the response results in a psychosomatic disorder, in this case tachycardia. The initial study was followed up by interviews

which replicated the original findings (Graham, Lundy, Benjamin, Kabler, Lewis, Kunish, and Graham, 1962). In another study certain attitudes were hypnotically induced in subjects and the physiological responses were monitored. The changes in physiological functions were significantly associated with the attitudes which were associated with the psychosomatic disorders (Graham, Stern, and Winoker, 1958).

In another attempt to replicate these results, Peters and Stern (1974) used two methods to induce the attitudes. They found that many of the effects were due to the method of induction of the attitudes. This failure to replicate calls the original results into question. Because the results are mixed, we can not draw strong conclusions. However, we can use these results to form further questions. The research discussed suggests that certain styles of coping may be related to certain psychosomatic disorders by mediating the effects of stress on physiological response systems. One implication of this theory is that individuals may have characteristic patterns of response to stress, a concept which has been explored in the research on individual response specificity. Lacey, Bateman, and Van Lehn (1953) have reported that individual subjects tend to exhibit similar physiological response hierarchies regardless of the stimulus. Further support for this concept is found in Wenger, Clemens, Coleman, Cullen, and Engel (1961) and Roessler, Greenfield, and Alexander (1964). The latter of these two reports related the individual differences to a measure of the individual personality, namely ego strength.

Support for both individual response specificity and

stimulus response specificity can be found in the same study. Engel (1960) and Sersen, Clausen, and Lidsky (1978) report that hierarchies of response magnitude are significantly related to individuals and to the stimulus.

There has been some research relating response specificity to some psychosomatic disorders. Malmö and Shagass (1949) found that psychosomatic patients had significantly higher measures for those variables associated with their disorders than with unrelated variables in response to a heat stressor. For example, tachycardia patients responded highest in heart rate and headache patients responded most in frontal EMG and head movements. Engel and Bickford (1961) exposed hypertensive and normotensive individuals to a variety of stressors and monitored physiological response systems. They reported evidence for both individual response and stimulus response specificity. Interestingly, hypertensives had the highest magnitude of response in blood pressure to a range of stressors while normotensives had their highest magnitude of response in a mixed bag of response systems.

Several studies report lower arousal when active coping or behavioral control was allowed (Greer, Davison, and Gatchel, 1970, Bjorkstrand, 1973, Szpiller and Epstein, 1976, Gatchel and Proctor, 1976) when arousal is measured by galvanic skin response. Using the same measure, Furedy (1970) and Furedy and Doob (1971) did not find that behavioral control lowered arousal. When blood pressure is used as the measure of arousal, behavioral control has been found to both raise (Light and Obrist, 1980) and lower (Hokanson, DeGood, Forrest, and Brittain, 1971) response to

a stressful situation. Manuck, Harvery, Lechleiter, and Neal (1971) found that this discrepancy can be partly explained by characteristics of the situational task, in this case the level of difficulty of the task.

In addition to parameters of the coping task, there are other possible reasons why inconsistent effects of behavioral control have been reported. First, most of the studies which report greater arousal with behavioral control used cardiovascular measures as the indicant of arousal. Most of the studies which reported lower arousal with behavioral control used galvanic skin response as the indicant of arousal. Research by Lacey and Lacey (1970) on response fractionation suggests that physiological response systems may react differentially to the same stimulus. Thus, it may not be useful to talk about physiological arousal as a unitary process. Secondly, Obrist (1976) in a series of related studies has demonstrated that under conditions of mild to moderate stress, persons exhibit a covariation between cardiovascular and somatic response systems which Obrist assumes to result from oxygen requirements of active skeletal muscles. Thus, coping responses which require skeletal activity may be accompanied by increased cardiovascular activity; and, if these coping responses reduce perceived stress, they may also be accompanied by reduced activity in other systems of arousal such as galvanic skin response.

Another approach to resolving these contradictions may lie in the study of variables which mediate the effects of coping on arousal. In particular, characteristics of the individual may interact with characteristics of the stimulus in affecting the

response (DeGood 1975, Houston, 1972). In addition, characteristics of the coping strategy may interact with characteristics of the stressor in affecting the response (Monat, Averill, and Lazarus 1972 Holmes and Houston, 1974).

Relationships among stressors, coping strategies, and responses are complex, but these relationships appear to vary as a function of parameters associated with the situation and with the individual. Within this context, this study will investigate two general areas. First, according to Obrist (1976) somatic and cardiovascular activity are centrally coupled, and under conditions of mild to moderate stress, these two systems will covary. Therefore, a behavioral coping strategy will result in greater increases in somatic and cardiovascular measures than would a cognitive coping strategy. Second, individuals seem to vary with regard to their typical coping style and situations which allow a typical coping strategy to be used should result in less stress than situation which do not allow a typical coping strategy to be used.

HYPOTHESES

Regardless of their typical coping strategy, subjects will exhibit greater responses in heart rate (HR) and muscle tension (EMG) in the situations requiring a behavioral response than in the situations requiring a cognitive response. Furthermore, the degree of usual behavioral coping style was expected to be associated with greater responses in HR and EMG to stress regardless of the required coping strategy because, as the result of many past experiences with paired stressor and behavioral response, the individuals may have become conditioned to exhibit

HR and EMG changes in reaction to stress even if the behavioral response is not allowed.

The third major hypothesis is that there will be significant interaction effects of situation and usual coping style on subjective and galvanic skin response (GSR) to stress. Highly behavioral copers in the behavioral condition and highly cognitive copers in the cognitive condition will experience less subjective and GSR arousal than highly behavioral copers in the cognitive condition and highly cognitive copers in the behavioral condition. This hypothesis is based on the prediction that subjects who are allowed to use a strategy with which they are familiar and for which they possess some competency will effectively reduce stress. The subjects will also express a significant verbal preference for the congruent conditions over the incongruent conditions.

METHODS

Design

The design of the study used a questionnaire to measure the extent to which subjects usually utilized behavioral and cognitive coping strategies. All subjects were then exposed to two situations- one requiring a behavioral coping strategy and one requiring a cognitive coping strategy. Physiological and subjective measures of arousal were monitored. In addition several questionnaires tapping behaviors potentially relevant to coping styles were administered.

Subjects

The 90 male subjects in this study were selected from a pool of undergraduates in a large introductory psychology class at a midwestern university. The participants in the study volunteered

in partial fulfillment of course research requirements.

Apparatus

A Grass Model 7 physiograph was used to monitor and record all physiological functions. A Grass 7F1 preamplifier was used to record GSR. Both tonic and phasic activity were monitored. GSR was monitored in units of resistance. However, GSR data was analysed in units of conductance as recommended by Fowles, Christie, Edelberg, Grings, Lykken, and Venables (1981). A Grass 7P3B preamplifier was used to measure raw EMG, and a Grass 7P10B integrator was used to measure integrated EMG. The 7P10B integrator provided marks, the frequency of which was proportional to the integrated EMG. HR was measured using a Grass 7P3 amplifier and scored as beats per minute as recommended by Jennings, Bers, Hutcheson, Obrist, Porges, and Turpin (1981).

The white noise was produced by a Grason Stadler noise generator, Model 901B. The 100 dB level was checked using a General Radio Company level monitor, Type 1551-C set at weighting scale A and a General Radio Company coupler, Model 1560.

Procedures

Subjects were given a pre-experimental interview in which the procedures were explained, and the subject was given a chance to volunteer to volunteer by signing an informed consent form. Each subject was asked to fill out the coping questionnaires. Then the subjects was asked to wash his hands in preparation for electrode placement.

Two standard Beckman silver/silver-chloride cup skin electrodes were attached to the subject. One was attached to the middle digit of the middle finger on the non-preferred hand. The

other was attached to the arm, two inches below the joint on the inner elbow. Skin electrode placement was consistent with recommendations of Fowles et. al. (1981). Heart rate and muscle tension electrode placement was preceded by scrubbing the electrode sites with isopropyl alcohol until resistance levels were at 10,000 ohms or less. Two Beckman silver/silver-chloride cup heart electrodes were attached to the subject, one was two inches below the sternum, the other was four to five inches lower on the left side of the heart. These electrode placements are consistent with the recommendations by Jennings et. al. (1981). The EMG headband electrodes were attached across the center of the frontal strip, approximately one inch above each eyebrow. Two Beckman gold cup electrodes were attached to the subjects head at the C3 and P3 sites. Subjects were told that these electrodes monitored brain wave activity, although no EEG recordings were made. In each case Beckman electrode conductive electrolyte cream was used to provide a contact between the surface of the electrode and the surface of the skin.

Subjects were seated in a reclining chair in a well lit, sound attenuated room and the Spielberger State Anxiety Inventory was administered. The subjects were then instructed to wear headphones and relax until the experimental tape was played through the headphones. After the experimenter left the room, there was a ten minute relaxation period. Subjects faced a single unlit light bulb and a bar press mechanism which were used in the reaction time task. There were two stress conditions; the order of presentation was randomized across subjects. The Spielberger instrument was administered to each subject just prior to and

immediately after each stress period. There was a ten minute relaxation period between the end of administering the questionnaire following the first stress period and the administering the questionnaire prior to the next stress period.

Stressor A and Stressor B consisted of the same tape recorded series of loud (100 dB) white noise tones randomly delivered over a five minute period. The series consisted of ten tones ranging from 0.5 seconds to 1.5 seconds in duration. The average interval between the tones was 25 seconds. The instructions for stressor A stated that the duration of the tones could be modified by having the subjects imagine a tree as soon as the light bulb lit up. The rationale given was that the image of the tree would result in a regular pattern of brain waves as monitored by the dummy EEG electrodes. The instructions for stressor B stated that the duration of the tones could be modified by pressing the bar as soon as the light bulb lit up. Following the presentation of both conditions, the subjects were asked which of the two stressors they would like to re-experience. This was taken as a measure of relative preference even though neither stressor was given a second time.

Coping Measures

There were four measures of coping style used in this study. The repression/sensitization scale (Byrne 1961, Carroll 1972) measures the extent to which a person either directly approaches a problem in the process of trying to cope. The locus of control or internal/external (I/E) scale (Rotter 1966) consists of 23 forced choice items which measures whether a person expects the

control of reinforcement to be internal or external to his/her self. The Miller Coping scale (Miller 1979) is a measure of whether people tend to monitor or distract themselves when dealing with a stressful situation. The Tanck-Robbins scale is a self-report inventory of 22 coping responses to stressful situations in the natural environment (Tanck and Robbins 1979).

Subjective Arousal

The Spielberger State Anxiety Inventory (STAI) was administered as a measure of subjective arousal. The STAI is intended as reflection of the intensity of an individual's feelings of anxiety at a particular moment in time.

Data Reduction

Tonic sudomotor activity was measured by galvanic skin response (GSR) non-specifics which were defined as fluctuations in skin conductance in excess of 250 ohms followed by a gradual return to baseline. The frequency of GSR non-specifics was calculated for each time period. Muscle tension (EMG) was measured by counting the number of integrated marks during each period, and heart rate (HR) was measured as the summed number of heart beats per epoch. For each of the three physiological measures, the last five minutes of the baseline was used as the baseline of the stress period which followed that rest period.

Prior to this study the Tanck-Robbins coping scale was given to four psychologists with instructions to decide which of the coping strategies were indicative of a behavioral response and which were indicative of a cognitive response. The scores of the experimental subjects on the resulting cognitive and behavioral sub-scales were used to identify the subjects as mainly cognitive or mainly behavioral copers.

This was accomplished by first standardizing each subjects score on the two sub-scales with a mean of zero and a standard deviation of one. The two scales were standardized because they had an unequal number of items. The standardized cognitive score was then subtracted from the standardized behavioral score in order to reflect the relative endorsement of behavioral coping responses over cognitive responses. The distribution of the differences was divided into thirds. Subjects in the upper third were labelled behavioral copers and subjects in the lower third were labelled cognitive copers. The middle third was not used in this analysis because they represented individuals who used cognitive and behavioral strategies in roughly the same proportion. This procedure resulted in 32 highly behavioral copers and 29 highly cognitive copers.

The discriminant function analysis required that subjects be classified according to system of greatest response. In order to compare the subjects responses in the various systems, the scores on these variables were transformed into standard scores using Engel's (1960) formula. These standardized scores reflect the deviation of observed scores from the expected scores on the basis of the distribution of the scores. Then subjects's standardized scores were examined to determine the system of greatest response. Subjects were grouped according to the system in which they exhibited their greatest response.

Results

To check the reliability of the physiological scores, one half of the protocols chosen at random were evaluated by a second

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evaluator, and a Pearson product-moment correlation coefficient was calculated. The reliability coefficient was 0.997 for HR, 0.999 for EMG, and 0.874 for the GSR data. The results were examined for the effects of the sequence in which the stressors were delivered, and this effect was found to be insignificant. In order to provide a manipulation check, following the procedure subjects were asked whether they believed they had control over the length of the tones. Sixty-one subjects believed they had control, and twenty-nine did not. The effect of belief in the manipulation was found to be insignificant.

The first main hypothesis predicted a significant effect of degree of usual behavioral coping style on HR and EMG, but not on GSR or STAI. This hypothesis was tested by performing split-plot analysis of covariance where the score on the behavioral sub-scale of the Tanck-Robbins was the crossed factor, and the stress condition was the factor nested within subjects. The results of these analysis are reported in Table 1. There were significant effects of coping style for GSR ($F=13.53$, $d.f.=1,87$, $p<0.0004$) and for EMG ($F=12.52$, $d.f.=1,85$, $p<0.00007$). No other effects were significant. The effect of the behavioral coping style on EMG is in the opposite direction as was predicted. The correlation between the two variables in the behavioral condition was -0.26 . In the cognitive condition, the correlation was -0.14 . The correlation between the behavioral sub-scale and the GSR variable was 0.30 for both conditions.

Because the results were not as predicted, further analyses were conducted. Subjects were divided into highly behavioral and highly cognitive copers using the method described in the Data

Reduction section above and a split plot analyses of covariance was performed. The results of these analyses are reported in Table 2. There were significant effects of coping style on HR and EMG, but these were in the opposite direction as was predicted. Highly cognitive copers had an adjusted mean of 61.64 for HR and 1071 for EMG, Highly cognitive copers had an adjusted mean of 64.61 for HR and 14.51 for EMG. Thus, highly behavioral copers demonstrated lower HR and EMG regardless of the condition.

The second hypothesis predicted that the behavioral condition would elicit greater changes in HR and EMG than would the cognitive condition. This hypothesis was tested using the same split-plot analyses of covariance used to test the first hypothesis. (See Table 1) The stress condition had a significant effect only on EMG ($F=6.41$, $d.f.=1,84$, $p<0.01$). The adjusted mean value for EMG is 12.04 in the behavioral condition and 11.19 in the cognitive condition. This difference is in the expected direction and is significant. The adjusted mean value for HR is 62.59 in the behavioral condition and 62.35 in the cognitive condition. This difference is in the expected direction but is not significant.

The third main hypothesis predicted that behavioral copers would exhibit less stress as measured by GSR and STAI in the behavioral condition, and cognitive copers would exhibit less stress measured by the same variables in the cognitive condition. This hypothesis was tested by dividing the subjects into highly behavioral and highly cognitive copers as described in the Data reduction section described above, and then performing planned comparisons using a formula recommended by Kirk (1968) for split-

plot comparisons. The results of these comparisons can be found in Table 3. There was a significant difference between the cognitive and behavioral condition for the behavioral copers for STAI ($t=5.79$, $d.f.=178$, $p<0.001$) and for GSR ($t=2.37$, $d.f.=178$, $p<0.001$). The difference for STAI was in the expected direction. However the difference in GSR was not in the expected direction. The parallel planned comparisons for the cognitive copers were not significant, however they were both in the expected direction.

Four canonical correlations were performed. In each case all of the coping questionnaires were used as predictors. In the first analysis criterion variables were defined as the difference between the baseline and the behavioral condition period for the response variables. The second analysis used the difference between the baseline and the cognitive condition for the response variables as the criterion variables. The third analysis used the value of the response variables during the baseline prior to the behavioral condition and the fourth analysis used the values of the response variables during the baseline prior to the cognitive condition.

The only analysis to produce a significant canonical correlation was the analysis which used the values during the baseline prior to the behavioral condition as the criterion variables. The canonical correlation was significant at the 0.01 level. However, the canonical correlation had a value of 0.48 and an eigenvalue of 0.23 indicating that only 23% of the variance was shared between the predictors and the criteria. In addition

these results were not replicated in the parallel analysis using the baseline values prior to the cognitive condition.

Discriminant function analyses were conducted to see if some weighted combination of the coping variables could be used to predict the system of greatest response for both the behavioral and cognitive condition. The results of these analyses indicate that none of the discriminant function analyses exhibited uniformly accurate classification functions that could be used to predict the response system of greatest magnitude.

DISCUSSION

The predicted effects of condition on HR and EMG were found although only the effect on EMG was significant. This implies that an individual's response to stress in a system usually labelled namely HR and other systems such as muscle tension may be affected by an aspect of the individual which is under voluntary, namely whether the individual uses a behavioral or a cognitive coping strategy.

An interesting, although unexpected result of this study was that highly behavioral copers exhibited lower HR, EMG, and STAI than did highly cognitive copers for both of the conditions. However, the reverse was true for GSR. Highly cognitive copers exhibited lower GSR than did the highly behavioral copers during both of the conditions. Perhaps highly behavioral copers are more efficient users of their cardio-vascular and skeletal-muscular systems, that is, these systems may be less aroused in behavioral copers when dealing with stress. Because only four response systems were sampled, it is difficult to interpret these results

with confidence. However, in a general sense these results indicate that different coping styles might be differentially effective in ameliorating response to stress in different systems.

The third main hypothesis predicted that congruity between the usual coping style and the stressor would result in less stress as measured by GSR and STAI than would incongruity. Although none of the differences were significant, three of the four were in the expected direction, indicating some limited support for the hypothesis. These results are consistent with Houston (1975) and DeGood (1972) who found less subjective stress where congruity between the stressor and the usual coping style existed when the coping style was measured using the I/E scale instead of the Tanck-Robbins as was done in the present study. Therefore, one way of reducing stress may be to allow an individual to choose his/her coping response. This is a hypothesis which can be examined with further research.

Failure to find strong support for the three main hypotheses in the present study may be related to several methodological issues. First the stressor may not have been sufficiently stressful. Perhaps a series of random 100 dB white noise bursts is not intense enough to elicit the levels of stress where differences between the two conditions may be found. An analysis to test the effect of the stressor found significant differences only for the GSR and STAI variables. Also there were no significant differences due to belief in the experimental manipulation, indicating that subjects who did not believe the manipulation experienced as much stress as those who did not

believe the manipulation.

A second reason may be related to the primary coping measure. The behavioral coping sub-scale of the Tanck-Robbins was developed for this study and has not been validated, nor have any of its psychometric properties been evaluated. Furthermore, the method of assessment results in a behavioral score even if the subject uses cognitive strategies as well.

The failure to find a linear discriminant function which can identify subjects as to their system of greatest response may be due to the classification system used in this study. Classifying people by the single system of greatest response may result in heterogeneous groups due to the order of magnitude of response in the remaining three variables. For example, some of the subjects who respond most in GSR may have HR as their system of second greatest response and some may have EMG as their system of second greatest response. A more fruitful method may be to class people on the basis of the order of magnitude of response for all four variables. This would result in 24 classification groups. The present sample size ($n=90$) is too small to accomodate this analysis. However, investigations of this question with a larger sample size is a question for future research.

The coping questionnaires used in this study did not yield all of the predicted results. The instruments used in this study were designed to tap psychological phenomena associated with real-life stressors which tend to be non-discrete. The stressors used in this study were discrete events which called for discrete coping responses. Questionnaires to tap discrete coping responses

could be developed in the future. Perhaps these questionnaires would result in more accurate discriminant functions.

Interpretation of the only significant canonical correlation is problematic. The correlation was not replicated in the analysis which used the other set of baseline values for the criterion indicating that the correlation may not be robust. In addition the predictor variables with the highest absolute values for the canonical coefficients were the Repression/Sensitization and the behavioral sub-scale of the Tanck-Robbins, and the criterion variables with the highest absolute values for the canonical coefficients were GSR and HR. Unfortunately, this combination of variables does not lend itself to a readily recognizable factor interpretation.

TABLE 1

Results of Multiple Regression Split-Plot
Analysis of Covariance for All Response Variables
Using Baseline as Covariate

Response Variable	Source	F ratio	df	p
Heart rate	Condition	0.58	1,85	0.45
	Coping Style	1.29	1,85	0.26
Muscle Tension	Condition	6.41	1,84	0.01
	Coping Style	12.52	1,84	0.0007
GSR	Condition	1.46	1,87	0.23
	Coping Style	13.53	1,87	0.0004
Spielberger Anxiety Inventory	Condition	0.00	1,85	0.98
	Coping Style	1.29	1,85	0.26

TABLE 2

Results of Split-Plot Analysis of Covariance
Using Baseline Values as Covariate
for Extreme Groups of Coping Style

Response Variable	Source	F ratio	df	p
Heart Rate	Condition	6.56	1,57	0.01
	Coping Style	9.51	1,57	0.003
Muscle Tension	Condition	1.97	1,56	0.17
	Coping Style	11.75	1,56	0.001
GSR	Condition	2.31	1,58	0.13
	Coping Style	5.50	1,58	0.02
Spielberger Anxiety Inventory	Condition	1.43	1,58	0.24
	Coping Style	6.49	1,58	0.01

TABLE 3

Results of the Planned Comparisons to Test
the Interaction Hypothesis

BEHAVIORAL COPERS IN THE COGNITIVE CONDITION
VS.
BEHAVIORAL COPERS IN THE COGNITIVE CONDITION

<u>Response Variable</u>	<u>t ratio</u>	<u>p</u>
Spielberger Anxiety Inventory	5.79	0.001
GSR	2.37	0.01

COGNITIVE COPERS IN THE COGNITIVE CONDITION
VS.
COGNITIVE COPERS IN THE BEHAVIORAL CONDITION

<u>Response Variable</u>	<u>t ratio</u>	<u>p</u>
Spielberger Anxiety Inventory	0.91	0.21
GSR	1.16	0.13

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